

10/009867

JC14 Rec'd PCT/PTO 11 DEC 2001

Practitioner's Docket No. 302.05-US1

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

**TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)**

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

| | | |
|----------------------------------|---------------------------|--------------------------------------|
| PCT/US00/18705 | 7 July 2000 (7.07.00) | None |
| International Application Number | International Filing Date | International Earliest Priority Date |

TITLE OF INVENTION: IRRIGATION CONTROLLER USING REGRESSION MODEL

APPLICANT(S): John ADDINK and Sylvan Addink

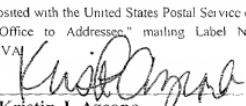
Box PCT
U.S. Patent and Trademark Office
PO Box 2327
Arlington, VA 22202
ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. SECTION 1.10*

(Express Mail label number is **mandatory**)

(Express Mail certification is optional)

I hereby certify that this paper, along with any document referred to, is being deposited with the United States Postal Service on this date November 26, 2001, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EV011336650US, addressed to the US Patent Office, PO Box 2327, Arlington, VA



Kristin J. Azcona

WARNING:

Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. Section 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence

***WARNING:**

Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing 37 C.F.R. Section 1.10(b)

"Since the filing of correspondence under [Section] 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,430, at 56,442.

1. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. Section 371:

a. This express request to immediately begin national examination procedures (35 U.S.C. Section 371(f)).

b. The U.S. National Fee (35 U.S.C. Section 371(c)(1)) and other fees (37 C.F.R. Section 1.492) as indicated below:

2. Fees

| CLAIMS FEE* | (1) FOR | (2) NUMBER FILED | (3) NUMBER EXTRA | (4) RATE | (5) CALC-ULATIONS |
|--|---|------------------|------------------|-------------|-------------------|
| | TOTAL CLAIMS | 15 -20 = | 0 | x \$18.00 = | \$0.00 |
| | INDEPENDENT CLAIMS | 1 -3 = | 0 | x \$80.00 = | \$0.00 |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00 | | | | | \$0.00 |
| BASIC FEE | U.S PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in Section 1.482 has been paid on the international application to the U.S. PTO: and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(2) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. Section 1.492(g)(4)) \$100.00 | | | | |
| | Total of above Calculations | | | | |
| SMALL ENTITY | Reduction by 1/2 for filing by small entity, if applicable Affidavit must be filed (note 37 CFR Sections 1.9, 1.27, 1.28) | | | | |
| | Subtotal | | | | |
| | Total National Fee | | | | |
| | Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. Section 1.21(h)). See attached "ASSIGNMENT COVER SHEET" | | | | |
| TOTAL | Total Fees enclosed | | | | |

*See attached Preliminary Amendment Reducing the Number of Claims.

A check in the amount of \$50.00 to cover the above fees is enclosed.

3. A copy of the International application as filed (35 U.S.C. Section 371(c)(2)) is not required, as the application was filed with the United States Receiving Office.

4. A translation of the International application into the English language (35 U.S.C. Section 371(c)(2)) is not required as the application was filed in English.

5. Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. Section 371(c)(3)) are transmitted herewith.

6. A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. Section 371(c)(3)) is not required as the amendments were made in the English language.

7. A copy of the international examination report (PCT/IPEA/409) is not required as the application was filed with the United States Receiving Office.

8. Annex(es) to the international preliminary examination report is/are not required as the application was filed with the United States Receiving Office.

9. A translation of the annexes to the international preliminary examination report is not required as the annexes are in the English language.

10. An oath or declaration of the inventor (35 U.S.C. Section 371(c)(4)) complying with 35 U.S.C. Section 115 is submitted herewith, and such oath or declaration is attached to the application.

II. Other document(s) or information included:

11. A Preliminary Amendment is enclosed.

12. An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a) is not required, as the application was searched by the United States International Searching Authority.

13. An Information Disclosure Statement under 37 C.F.R. Sections 1.97 and 1.98 will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. Section 371(c).

14. Additional documents:

a. Copy of request (PCT/RO/101)

15. The above items are being transmitted before 30 months from any claimed priority date

AUTHORIZATION TO CHARGE ADDITIONAL FEES

The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No.: 500341.

37 C.F.R. Section 1.492(a)(1), (2), (3), and (4) (filing fees)

37 C.F.R. Section 1.492(b), (c), and (d) (presentation of extra claims)

37 C.F.R. Section 1.17 (application processing fees)

37 C.F.R. Section 1.17(a)(1)-(5) (extension fees pursuant to Section 1.136(a))

Date: December 11, 2001



Robert D. Fish
Fish & Associates, LLP
1440 N. Harbor Blvd.
Suite 706
Fullerton, CA 92835
USA

F0112179860001

Practitioner's Docket No. 302.05-US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231Inventor: **Aqua Conservation Systems,
Inc.**Examiner: **Not Yet Assigned**Serial No: **U.S. National Phase Based on
PCT/US00/18705**Art Unit: **Not Yet Assigned**Filed: **July 7, 2000**For: **Irrigation Controller Using
Regression Model****PRELIMINARY AMENDMENT**Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Following is a clean copy of the claims amended herein:

IN THE CLAIMS:

1. (Amended) An irrigation controller comprising:
 - a memory that stores a regression model;
 - a microprocessor that applies a current value for an environmental factor to the regression model to estimate a current evapotranspiration rate (estimated ETo); and
 - a mechanism that uses the estimated ETo to affect an irrigation schedule executed by the controller.

REMARKS

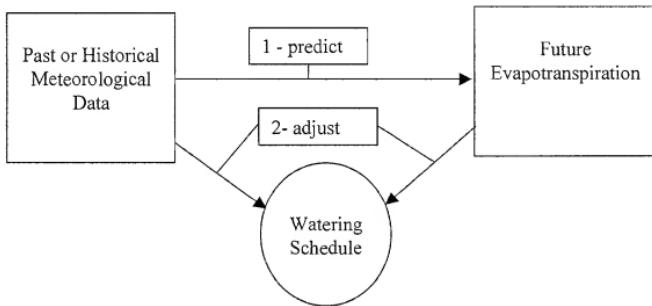
This paper responds to rejections set forth in the International Preliminary Examination Report of PCT/US00/18705.

Oliver (U.S. Patent 5696671)

Oliver teaches using past or historical meteorological data (“a meteorological model”) to 1) predict future evapotranspiration, and 2) make adjustments to watering schedules. The teachings are apparent from the following quotations:

- “If desired, ET₀ values for a particular site can be predicted based upon a meteorological model for that site.” (Column 5, lines 45-6);
- “Past or historical meteorological data is used to make corrective adjustments to the watering schedules...” (Column 5, lines 61-62).
- “...future predictions of ET₀ and/or precipitation values are used to determine when and how much to water.” (Column 6, lines 9-10).

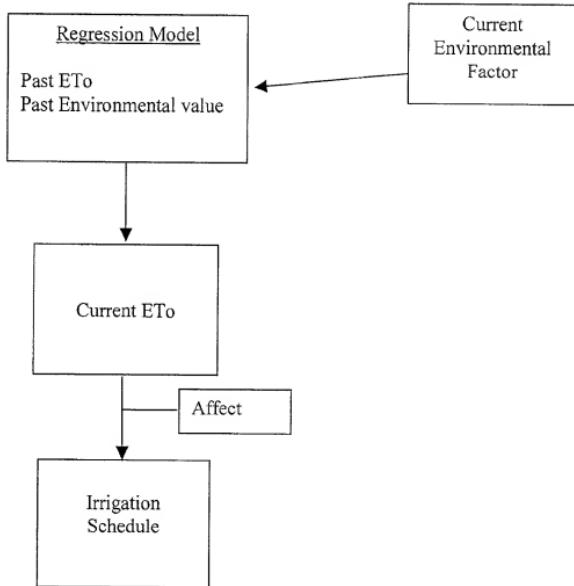
Oliver may be depicted as follows:



Overview of claim 1

Amended claim 1 requires a regression model that is “based upon a comparison of historical ET₀ values against corresponding historical environmental values” (Specification, Page 2, lines 28-29). A current value for an environmental factor is applied to the regression model to estimate a current ET₀. (Claim 1, “applies a current value for an environmental factor to the regression model to estimate a current evapotranspiration rate (estimated ET₀)”). The current ET₀ is then used to affect an irrigation schedule executed by the controller (Claim 1, “uses the

estimated ET₀ to affect an irrigation schedule executed by the controller"). Claim 1 may be depicted as follows:



Novelty (35 USC §102)

The Office considers claims 1-15 to be anticipated by Oliver. The applicant disagrees, especially in view of the amendments contained herein.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a

single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). (MPEP §2131).

Oliver cannot possibly anticipate claim 1 (and claims 2-15 by virtue of their dependence on claim 1) because Oliver fails to disclose the following recited elements:

"a regression model";

"a current value for an environmental factor";

applying "a current value for an environmental factor" to the regression model; and

"a current evapotranspiration rate".

The specification defines a regression model that is "based upon a comparison of historical ETo values against corresponding historical environmental values" (Specification, Page 2, lines 28-29). Oliver's model is not a regression model as defined by the specification because it only includes historical meteorological data, and there is no comparison disclosed.

Oliver may teach past and even future (predictive) environmental factors, but Oliver does not disclose a current environmental factor, much less applying a current environmental factor to the regression model.

Oliver also fails to disclose current evapotranspiration amounts. The Examiner points out that Oliver does disclose prediction of future meteorological conditions on an hourly basis (column 5, lines 50-51). However, future conditions are not the same thing as current conditions.. "Current" implies calculation of ETo at an instant or the present time, not at a future time.

Based on the above analysis, Oliver lacks disclosure of each and every limitation of the claims as required by the MPEP §2131. Therefore, Oliver fails to anticipate claim 1. Claims 2-15 are not anticipated by virtue of their dependence on claim 1.

TODD 05/18/2024 10:24 AM

Inventive Step (35 USC §103)

The Office considers claims 1-15 to be obvious over Oliver. The applicant respectfully disagrees, especially in view of the amendments contained herein.

To establish a prima facie case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings (MPEP §2142).

Certainly Oliver fails to teach or suggest an irrigation controller having a regression model. Oliver also fails to motivate one of ordinary skill to place a regression model in an irrigation controller because Oliver apparently does just fine with its own method of making future predictions based on a weighted averages.

Oliver also fails to teach, suggest, or motivate one of ordinary skill to use “current” values in the calculations, much less applying “a current value to the regression model”. For example, applying “a current value for an environmental factor” may be exemplified by determining a current temperature then applying that temperature to the regression model. There is certainly no teaching, suggestion, or motivation within Oliver to take a current temperature or any other current environmental factor. Quite to the contrary, Oliver teaches making predictions of future values based on past values. Making these predictions “on an hourly basis” concerns only the frequency of the predictions. A current environmental factor is not a prediction based on the past. Consequently, Oliver does not suggest or motivate the limitation of applying a current value to the regression model.

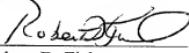
Moreover, Oliver also fails to teach, suggest, or motivate one of ordinary skill to use a “current” ETo value. Oliver is based on using predictive or future evapotranspiration rates to adjust a watering schedule. Apparently, Oliver calculates a cumulative depletion level of water in the soil (“That is, as each day becomes past or historical, adjustments to the overall cumulative depletion of water in the soil need to be made.” Column 5, lines 63-65). One of ordinary skill in the art would not be motivated to include a “current” evapotranspiration rate since Oliver uses predictive ETo to affect the cumulative depletion level (“If the predicted ETo was lower than the actual ETo value, the cumulative depletion value would be increased” Column 6, lines 26-28).

Using a current ETo would produce different results in the calculation of the cumulative depletion level.

Based on the preceding analysis, Oliver fails to teach, suggest or motivate one of ordinary skill in the art to modify the reference to include at least three of the limitations of claim 1. Thus, claim 1 (and claims 2-15 by virtue of their dependence) is not obvious over Oliver.

Respectfully submitted,

Fish & Associates, LLP

By: 
Robert D. Fish
Reg. No. 33,880

Dated: December 11, 2001

Attorneys for Applicant(s)
1440 N. Harbor Blvd, Suite 706
Fullerton, CA 92385
Tel.: (714) 449-2337
Fax: (714) 449-2339

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) An irrigation controller comprising:
a memory that stores a regression model;
a microprocessor that applies a current value for an environmental factor to the regression model to estimate a current evapotranspiration rate (estimated ETo); and
a mechanism that uses the estimated ETo to affect an irrigation schedule executed by the controller.

卷之三

IRRIGATION CONTROLLER USING REGRESSION MODEL

Field of the Invention

The field of the invention is irrigation controllers.

Background of the Invention

Many irrigation controllers have been developed for automatically controlling application of water to landscapes. Known irrigation controllers range from simple devices that control watering times based upon fixed schedules, to sophisticated devices that vary the watering schedules according to local geography and climatic conditions.

With respect to the simpler types of irrigation controllers, a homeowner typically sets a watering schedule that involves specific run times and days for each of a plurality of stations, and the controller executes the same schedule regardless of the season or weather conditions. From time to time the homeowner may manually adjust the watering schedule, but such adjustments are usually only made a few times during the year, and are based upon the homeowner's perceptions rather than the actual watering needs. One change is often made in the late Spring when a portion of the yard becomes brown due to a lack of water. Another change is often made in the late Fall when the homeowner assumes that the vegetation does not require as much watering. These changes to the watering schedule are typically insufficient to achieve efficient watering.

More sophisticated irrigation controllers usually include some mechanism for automatically making adjustments to the irrigation run times to account for daily environmental variations. One common adjustment is based on soil moisture. It is common, for example, to place sensors locally in the soil, and suspend irrigation as long as the sensor detects moisture above a given threshold. Controllers of this type help to reduce over irrigating, but placement of the sensors is critical to successful operation.

Still more sophisticated irrigation controllers use evapotranspiration rates for determining the amount of water to be applied to a landscape. Evapotranspiration is the water lost by direct evaporation from the soil and plant and by transpiration from the plant surface. Potential (i.e., estimated) evapotranspiration (ET₀) can be calculated from meteorological data collected on-site, or

from a similar site. ETo data from meteorological monitoring equipment located on the irrigation site is thought to provide the most efficient irrigating of the landscape, however, monitoring equipment required to obtain the ETo values is very expensive to install and operate. Therefore, most of the data for ETo calculations is gathered from off-site locations that are frequently operated
5 by government agencies. The ETo data is then broadcast by various methods to the irrigation sites. One such system, disclosed in US Patent No. 4,962,522, issued October 1990, and in US Patent No. 5,208,855, issued May 1993, both to Marian, transmits ETo values for multiple geographic zones. Irrigation controllers receive and extract appropriate data for the local conditions, and then use the extracted data to calculate run times. Unfortunately, known controllers of this type are notoriously
10 complicated to use, and even systems touting automatic adjustment of irrigation flow still require relatively complicated input. Systems discussed in the 5,208,855 patent, for example, receive the signal, and update the interval used for preset irrigation control timings rather than determine an entirely new irrigation schedule. Systems discussed in US Patent No. 5,444,611 issued August, 1995 to Woytowitz et al., automatically calculate and execute a new schedule, but the new schedule is based upon meteorological data that may not be applicable to the local conditions.

PCT-US 00/18705

Thus, because of cost and/or complicated operating requirements, most residential and small commercial landscape sites are primarily irrigated by controllers that provide inadequate schedule modification. This results in either too much or too little water being applied to the landscape, which in turn results in both inefficient use of water and unnecessary stress to the plants. Therefore,
20 a need still exists for a cost-effective irrigation system for residential and small commercial landscape sites, which is capable of frequently varying the irrigation schedule based upon estimates of actual water requirements.

Summary of the Invention

The present invention provides systems and methods in which an irrigation controller uses a
25 regression model to estimate an evapotranspiration rate (estimated ETo), and uses the estimated ETo to affect an irrigation schedule executed by the controller.

The regression model is preferably based upon a comparison of historical ETo values against corresponding historical environmental values, with the data advantageously spanning a

time period of at least two days, and more preferably at least one month. Data from multiple environmental factors may also be used.

The environmental factor(s) utilized may advantageously comprise one or more of temperature, solar radiation, wind speed, humidity, barometric pressure, and soil moisture. Values 5 relating the environmental factor(s) may enter the controller from a local sensor, a distal signal source, or both.

Various objects, features, aspects, and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the invention, along with the accompanying drawings in which like numerals represent like components.

Brief Description of the Drawings

Figure 1 is a flow chart of a preferred embodiment of the method of the present invention.

Figure 2 is a figure showing an exemplary relationship of ETo versus temperature.

Figure 3 is a flow chart of the steps in the determination of a regression model which would be programmed in irrigation controllers.

Figure 4 is a map depicting how California might be divided into zones with similar evapotranspiration characteristics, and the location of a representative weather station within each zone.

Figure 5 is a schematic of an irrigation controller.

Figure 6 is a flow chart of an irrigation system according to the present invention.

20 Figure 7 is a figure showing an exemplary comparison between ETo values determined according to the present invention and actual ETo values for 1999 from a weather station located at Merced, California.

Detailed Description

In Figure 1 a method of controlling irrigation run time generally comprises providing historical ETo values 10; providing corresponding environmental values 20; performing a linear

regression for the historical ETo values and the historical environmental values 30; determining a regression model 40; obtaining a current local value for an environmental factor 50; applying that value to the regression model 40 to estimate current ETo 60; using the current ETo to determine the watering schedule 70; and then executing the watering schedule 80.

5 The historical ETo values may be obtained from a number of sources, including government managed weather stations such as CIMIS (California Irrigation Management Information System, maintained by the California Department of Water Resources), CoAgMet maintained by Colorado State University-Atmospheric Sciences, AZMET maintained by University of Arizona-Soils, Water and Environmental Science Department, New Mexico State University-Agronomy and Horticulture, and Texas A&M University-Agricultural Engineering Department. Although slight variations in the methods used to determine the ETo values do exist, most ETo calculations utilize the following environmental factors: temperature, solar radiation, wind speed, vapor pressure or humidity, and barometric pressure.

10 Figure 2 shows an exemplary relationship of temperature versus ETo over a month. An increase in temperature generally results in an increase in the ETo value, with the opposite occurring upon a decrease in temperature. The other factors have greater or lesser effects than temperature on ETo, but all have some effect on ETo, and each of the environmental factors can be used in the determination of a regression model.

15 Regression analysis can be performed on any suitable time period. Several years of data is preferred, but shorter time spans such as several months, or even a single month, can also be used. Different regression models can also be generated for different seasons during the year, for different geographic zones, and so forth.

20 The regression model is preferably programmed into the central processing unit or memory of the irrigation controller using a suitable assembler language or microcode (See Figure 5, 210 and 220). The value or values applied against the regression model are preferably obtained from one or more local sensors (see Figure 6, steps 311 through 316). The microprocessor based central processing unit may have conventional interface hardware for receiving and interpreting of data or signals such sensors.

In Figure 3 the initial step in a preferred determination of a regression model is to select zones with similar evapotranspiration characteristics, step 100. A representative weather station, which provides ETo values, is selected in the zone, step 110. Preferably, monthly linear regression is performed of one or more historical factor(s) against the historical ETo values, step 120.

5 Monthly regression models are determined from these regression relationships, step 130. All irrigation controllers located in a specific zone are then programmed with the regression models determined for that zone, step 140.

Figure 4 is a map depicting how California might be divided into zones with similar evapotranspiration characteristics, and the location of a representative weather station within each zone.

10 Figure 5 is a schematic of an irrigation controller programmed with a regression model that, along with other inputs and/or adjustments, would determine the run times for the various stations controlled by the irrigation controller. A preferred embodiment of an irrigation controller 200 generally includes a microprocessor based central processing unit 210, an on-board memory 220, some manual input devices 230 through 234 (buttons and knobs), a signal receiving device 240, a display screen 250, a plurality of electrical connectors 260 for connecting with solenoids 270, and a power supply 280. Each of these components by itself is well known in the electronic industry, with the exception of the programming of the microprocessor in accordance with the functionality set forth herein.

20 Figure 6 is a flow chart of an irrigation system according to the present invention. It starts with step 300 of providing an irrigation controller (See Figure 5, 200) with a regression model programmed in the microprocessor based central processing unit 200. Step 310 is the receiving of measurements of one or more current environmental factor(s). These measurements are applied to the regression model 320 and the run times are determined by the regression model 330. However, 25 the controller may not activate the valves to irrigate the landscape until an adequate irrigation run time has accumulated to permit for deep watering of the soil (not shown). When an adequate irrigation run time has been accumulated the controller will activate the valves to each station and the landscape will be irrigated 340, except when a manual or automatic override of irrigation occurs.

ART 34 AMENDT.
Practitioner's Docket No. 302.05-PCT

Figure 7 is a comparison between actual ETo values and ETo values determined according to the present invention for 1999 data from a weather station located at Merced, California. As the figure indicates, some differences do exist between actual ETo values and ETo values determined by the present invention. However, landscapes at Merced, California, receiving irrigation based on 5 the present invention, would receive close to the right amount of water required to maintain the plants in a healthy condition and with a reduced waste of water.

Controllers contemplated herein may, of course, advantageously include features that are not necessarily related to the provisioning or use of optionally sequential/concurrent stations. Among other things, contemplated controllers may employ software that obtains an evapotranspiration rate (ETo) from a distal source as described in pending US application serial number 09/082603. Contemplated controllers may also employ software that modifies watering patterns based upon a water budget or sensor input as described in pending US application serial numbers 09/478108 and 60/209709, respectively. Contemplated controllers may also employ a simplified adjustment mechanism such as a "more/less" button as described in pending US application serial number 09/603104. The disclosures of each of these applications are incorporated herein by reference in their entirety.

Thus, specific embodiments and applications of irrigation controllers using regression models have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those described are possible without departing from the inventive 20 concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims.

CLAIMS

What is claimed is:

1. An irrigation controller comprising:
a memory that stores a regression model;
a microprocessor that applies a value for an environmental factor to the regression model to estimate a current evapotranspiration rate (estimated ETo); and
a mechanism that uses the estimated ETo to affect an irrigation schedule executed by the controller.
2. The controller of claim 1 wherein the regression model is based upon a set of historical ETo values and a set of corresponding historical values for the environmental factor.
3. The controller of claim 2 wherein the set of historical ETo values spans a time period of at least two days.
4. The controller of claim 2 wherein the regression model is further based upon a second set of historical values for a second environmental factor.
5. The controller of claim 2 wherein the regression model comprises a linear regression.
6. The controller of claim 2 wherein the regression model comprises a multiple regression.
7. The controller of claim 1 wherein the environmental factor is temperature.
8. The controller of claim 1 wherein the environmental factor is solar radiation.
9. The controller of claim 1 wherein the environmental factor is wind speed.
10. The controller of claim 1 wherein the environmental factor is humidity.
11. The controller of claim 1 wherein the environmental factor is barometric pressure.
12. The controller of claim 1 wherein the environmental factor is soil moisture.

13. The controller of claim 2 wherein the environmental factor is selected from the group consisting of temperature, solar radiation, wind speed, humidity, barometric pressure, and soil moisture.
14. An irrigation system comprising an irrigation controller according to claim 1, and a local sensor that provides a signal corresponding to the value for the environmental factor.
15. An irrigation system comprising an irrigation controller according to claim 1, and a receiver that receives from a distal source a signal corresponding to the value for the environmental factor.

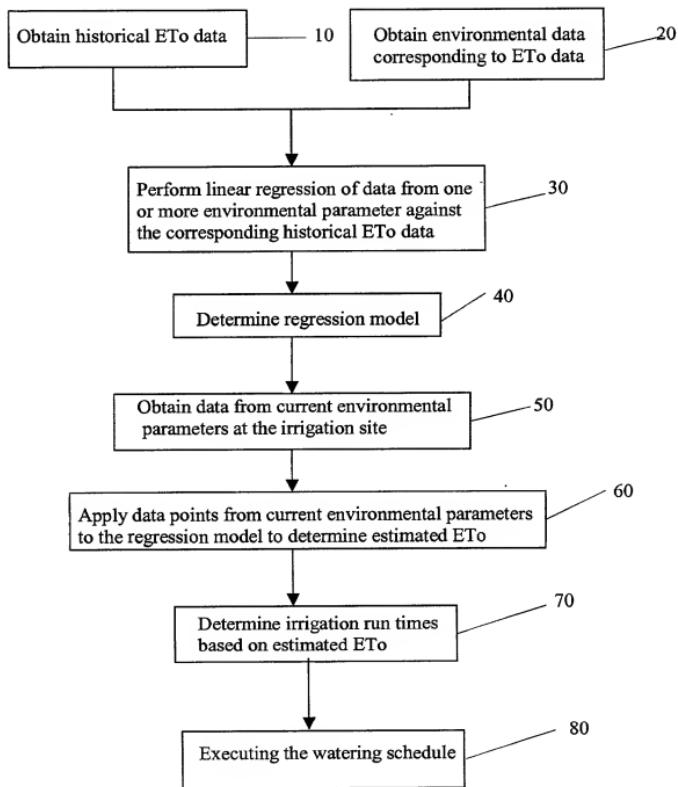


Figure 1

POTOMUS Box 18705

10/009867

2/7

ET vs Temperature

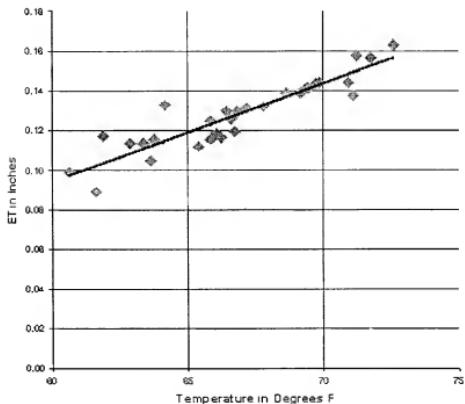


Figure 2

TOTY24" 29860000

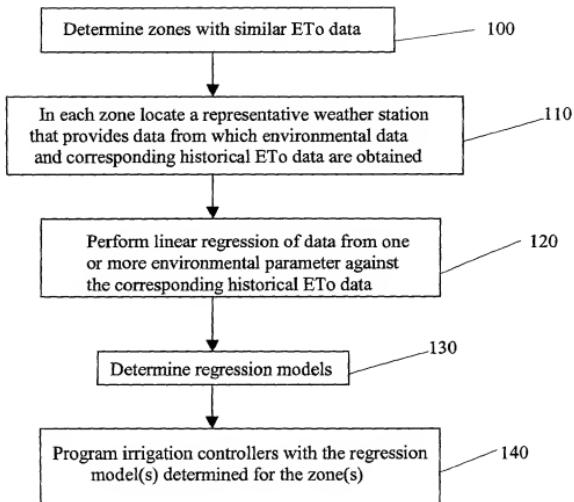


Figure 3

10009857-121101

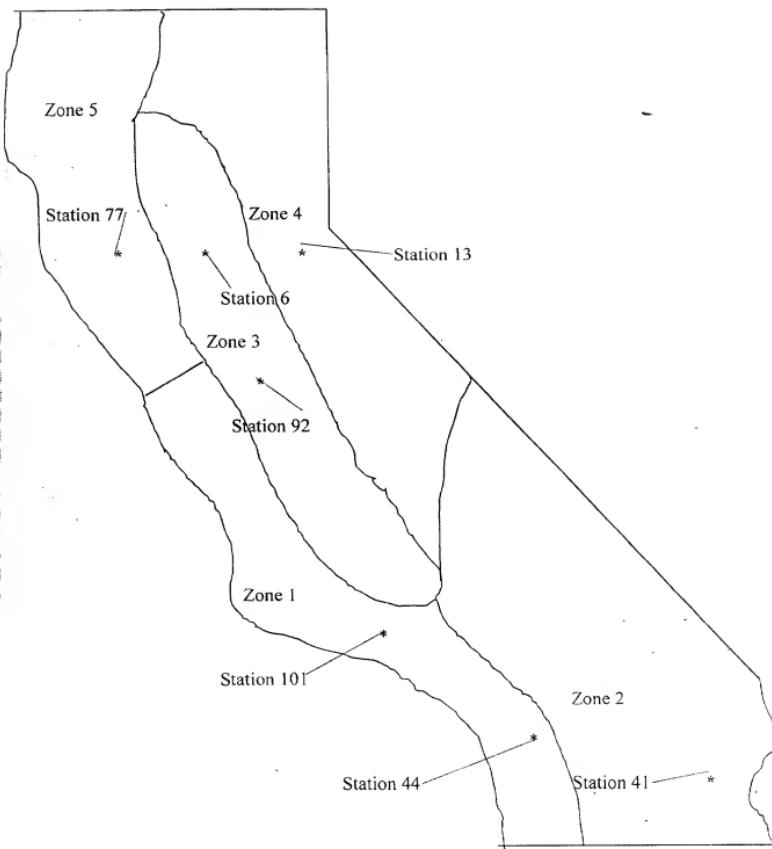


Figure 4

TOMITA, TSUBAKI

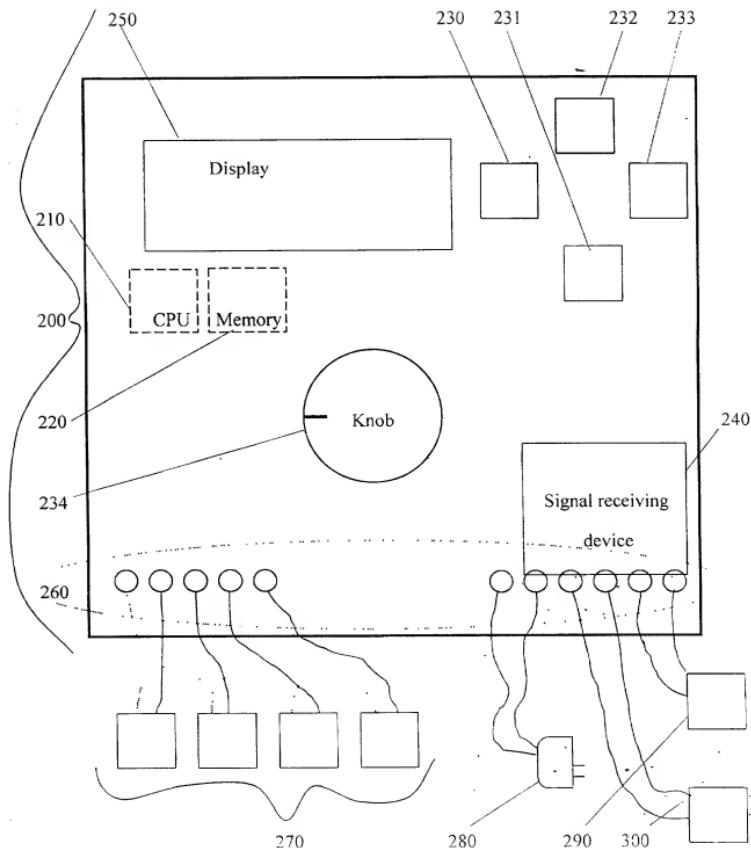


Figure 5

10/009867

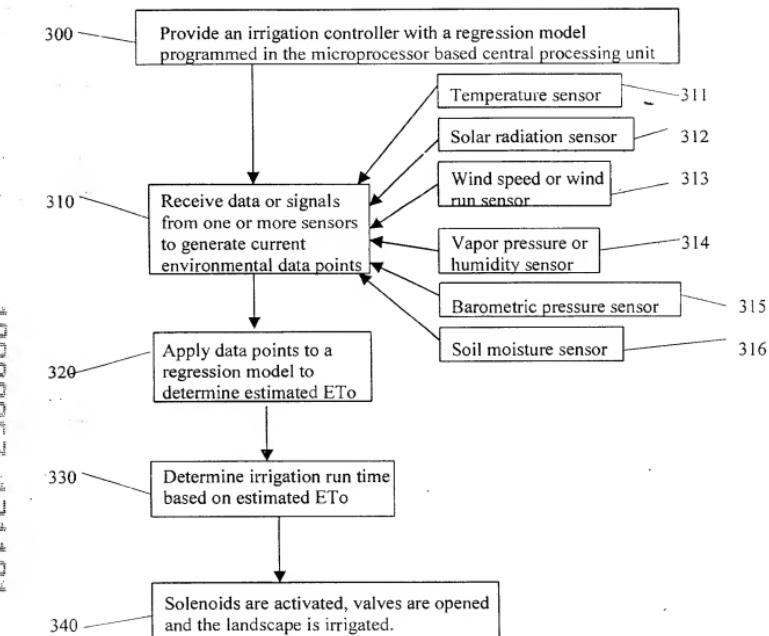


Figure 6

10/009867

PPCTUS 00/18709

7/7

Comparison Between Actual ETo and Estimated ETo Determined According to the Present Invention for 1999 from a Weather Station Located at Merced, California

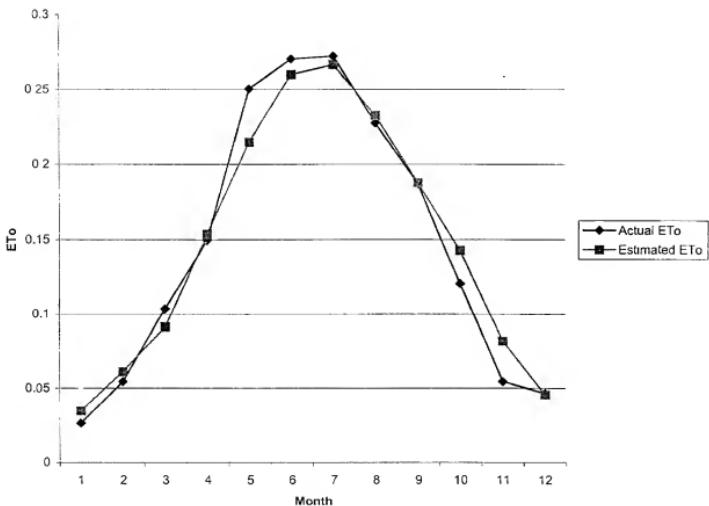


Figure 7

10009867-121102

COMBINED DECLARATION AND POWER OF ATTORNEY

**(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,
CONTINUATION, OR C-I-P)**

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is for a national stage of PCT application.

INVENTORSHIP IDENTIFICATION

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

IRRIGATION CONTROLLER USING REGRESSION MODEL

SPECIFICATION IDENTIFICATION

The specification was described and claimed in PCT International Application No. PCT/US00/18705 filed on July 7, 2000.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, Section 1.56, and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent.

TOP SECRET - 7336000

PRIORITY CLAIM (35 U.S.C. Section 119(a)-(d))

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed

Such applications have been filed as follows.

**PRIOR PCT APPLICATION(S) FILED WITHIN 12 MONTHS
(6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. SECTION 119(a)-(d)**

| INDICATE IF PCT | APPLICATION NUMBER | DATE OF FILING DAY, MONTH, YEAR | PRIORITY CLAIMED UNDER 35 U.S.C. SECTION 119 |
|-----------------|--------------------|------------------------------------|--|
| PCT | PCT/US00/18705 | 7 July 2000 | Yes |

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

APPOINTED PRACTITIONER(S)

Robert D. Fish

REGISTRATION NUMBER(S)

33880

David J. Zoetewey

46258

Sandra P. Thompson

46264

Martin Fessenmaier

31592

I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

SEND CORRESPONDENCE TO

Robert D. Fish
1440 N. Harbor Blvd.
Suite 706
Fullerton, CA 92835
USA

Customer Number 24392

DIRECT TELEPHONE CALLS TO:

Robert D. Fish
714-449-2337

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

1-0
John Addink

Inventor's signature

Date 6/27/00

Country of Citizenship U.S.A.

Residence Riverside, CA

Post Office Address 2900 Adams, Suite B6, Riverside, CA 92504, U.S.A.

John Addink

CA

2-0
Sylvan Addink.

Inventor's signature

Date 6/27/2000

Country of Citizenship U.S.A.

Residence Iowa City, IA

Post Office Address 2900 Adams, Suite B6 - Riverside, CA 92504, U.S.A.

Sylvan Addink

IA